PROC. BIOL. SOC. WASH.
90(2), pp. 326–347

HYPHESSOBRYCON SOCOLOFI, A NEW SPECIES OF CHARACOID FISH (TELEOSTEI: CHARACIDAE) FROM THE RIO NEGRO OF BRAZIL

Stanley H. Weitzman

Specimens of the new species described below were first noticed in a tropical fish store in the Washington, D.C., area in 1971. The species was being sold as the bleeding heart tetra, *Hyphessobrycon rubrostigma* Hoedeman 1954 (= *Hemigrammus erythrostigma* Fowler 1943). Several specimens were purchased and allowed to mature resulting in confirmation that they did represent a new species, one closely allied to *Hyphessobrycon erythrostigma* (Fowler). Géry (1972) has noted that *Hyphessobrycon rubrostigma* is a synonym of *Hemigrammus erythrostigma* and that under the Eigenmann (1917) system of classification the proper generic name for this fish should be *Hyphessobrycon erythrostigma* (Fowler). The new species differs most prominently from *H. erythrostigma* in that the adult males have shorter dorsal, anal, and pelvic fins and in that both sexes have a somewhat different color pattern in life and in preservative. Furthermore, males of the new species have numerous small bony hooks in the dorsal and anal fins. These are nearly absent in *H. erythrostigma.*

Unfortunately, the source of the new species was unknown but in 1976 Mr. Ross Socolof of Bradenton, Florida, was able to obtain live specimens with locality information through Mr. Gerald Entel of the Cardinal Aquarium at Manaus, Brazil. These were collected at or near Barcelos on the Rio Negro, State of Amazonas, Brazil. This has allowed the description of this new species and I take pleasure in naming it after Mr. Socolof who in a variety of ways has come to the aid of various ichthyologists and fisheries biologists.

Hyphessobrycon erythrostigma has been known to aquarists since before 1943 but it did not become well known or abundantly imported until about 1953. Géry (1972) records its distribution as "Upper Amazon, around Leticia in Brazil, Peru, and Colombia." The specimen described by Fowler (1943) was said to have come from Brazil and the seven specimens used by Hoedeman (1956) in his description of *H. rubrostigma* were said to come from ". . . irgendeinem Teile Kolumbiens. Die genaue Lokalität ist unglücklicherweise noch nicht bekannt." Only two specimens are known with definite locality information and these were reported by Géry (1965) from Igarapé Preto, a branch of the Rio Solimões in Brazil, near the little village of Belém, some 60 kilometers downstream from the frontier zone between Brazil, Peru, and Colombia. These specimens were collected by Harald Schultz in 1960 and are in the Senckenberg Museum,

SMF 7273–4. Aquarium specimens preserved at the National Museum of Natural History in 1958 were said to have come from Peru. Mr. Socolof informs me that this fish is exported from Leticia, Colombia, and that it is collected some distance west of there but that he was unable to obtain a more precise locality for the specimens he has provided for the description and comparison below.

During growth, important changes occur in the morphometric characters of the dorsal, anal, and pelvic fins of *H. erythrostigma*. These occur to a much lesser extent in *H. socolofi* and constitute one of the important means of distinguishing adult males of the two species. Because of this, for purposes of comparison certain morphometrics of adults are considered separately from juveniles in the discussion, and the fishes have been sorted into separate sexes. These specimens, although not considered useful for obtaining data suitable for a statistical analysis of allometric growth (especially since they were grown in aquaria), nevertheless do indicate the kinds of changes to be expected during growth in wild population samples.

The methods of counting and measuring specimens are those described for characoids by Fink and Weitzman (1974). Standard length (SL) and body measurements were taken in mm and measurements other than SL are expressed as percentages of standard length or as otherwise designated. In the descriptions below the figure given first in the case of morphometrics and some meristics is for the holotype, followed by the range and the mean for all males in parentheses ( ) and for the females in brackets [ ]. In some cases of meristics, only one series of figures, in parentheses ( ), is given after that of the holotype. This includes the counts for both males and females. Tooth counts were taken from the jaws of the left side. In the description of *H. socolofi* there is a total of 6 males 30.3 to 39.3 mm in SL and 4 females 30.6 to 38.5 mm in SL. In the description of *H. erythrostigma* the morphometrics include means for 7 males 29.1 to 60.6 mm in SL and for 7 females 29.0 to 53.3 mm in SL. Some counts and measurements could not be taken from the holotype of *H. erythrostigma* because the specimen had deteriorated; these are indicated by question marks. All means are for these specimens unless otherwise designated. Specimens have been deposited in the following museums: British Museum (Natural History) (BMNH); Museu de Zoologia da Universidade de São Paulo (MZUSP); and the National Museum of Natural History (USNM).

Hyphessobrycon socolofi, new species
Figs. 1–3

Holotype.—MZUSP 13181, male, 38.9 mm SL, Brazil, State of Amazonas, Rio Negro, Barcelos (62°57′W, 0°58′S), collected for Gerald Entel, Cardinal Aquarium, February–March, 1976.

Paratypes.—USNM 216612, 5 specimens (30.3–39.3 mm SL); BMNH 1977.1.19.1–2, 2 specimens (31.7–33.1 mm SL); MZUSP 13182 and 13183, 2 specimens (30.6–30.6 mm SL). All paratypes with same locality data as holotype.

Diagnosis.—The following combination of characters will distinguish this species from all others known in the genera *Hyphessobrycon*, *Hemigrammus*, or related putative genera of the Characidae. See Weitzman and Fink (in press) for a discussion of the problems concerning the phylogenetic interpretation and typological usage of the genera of the new world Characidae. Scales on caudal fin only at base. Maxillary with 3–10 teeth in adults; 2, occasionally 3, teeth in outer row of premaxillary and 5–7 teeth in inner row of premaxillary. Body depth 42.6–51.7% of standard length. A large black spot in distal two-thirds to four-fifths of dorsal fin. Distal portions of anterior second, third, and fourth rays of dorsal fin tipped with white. Males with numerous small bony hooks, one for each ray segment, on all branched portions of anterior fin rays of dorsal and anal fins. Length of anterior second, third, and fourth dorsal-fin rays of adult males about 30–35% of standard length (about 38–51% in adult males of *H. erythrostigma*); length of anterior fourth and fifth anal-fin rays of adult males about 18–22% of standard length (about 27–36% in adult males of *H. erythrostigma*). White stripe along base of anal fin with its anterior portion extending no further than about 50% distally on anterior anal-fin lobe. In life a moderate-size red spot (see Figs. 2 and 3) in central part of body just posterior to termination of perforated lateral-line scales in area on a vertical below just anterior to origin of dorsal fin (this red spot known only in one other species of characid, *H. erythrostigma*).

Description.—Body deep, sides compressed, greatest depth at anterior base (origin) of dorsal fin, 38.9 (44.2–51.7, $\bar{x} = 47.1$) [42.6–50.1, $\bar{x} = 46.0$]. Predorsal body profile gently convex but concave at nape and again convex at snout. Body profile along base of dorsal fin slightly convex, nearly straight to slightly convex from posterior insertion of dorsal fin to adipose fin, concave in region of caudal peduncle. Dorsal fin nearer to snout tip than to caudal-fin base. Distance between snout and anterior dorsal-fin origin 48.1 (47.1–51.4, $\bar{x} = 48.3$) [47.3–50.5, $\bar{x} = 49.1$]. Distance between anterior dorsal-fin origin and caudal-fin base 59.4 (58.7–62.0, $\bar{x} = 60.0$) [57.1–59.5, $\bar{x} = 58.5$]. Distance between posterior border of eye and dorsal-fin origin 61.0 (54.8–65.7, $\bar{x} = 59.0$) [57.5–63.5, $\bar{x} = 59.8$] % of distance between dorsal-fin origin and caudal-fin base. Ventral body profile moderately convex in males between symphysis of lower jaw and anal-fin origin; same profile strongly convex in most mature females (compare Figs. 2 and 3). Body profile strongly convex at base of first seven or eight rays of anal fin, then nearly straight to anal-fin termination where it is strongly angled

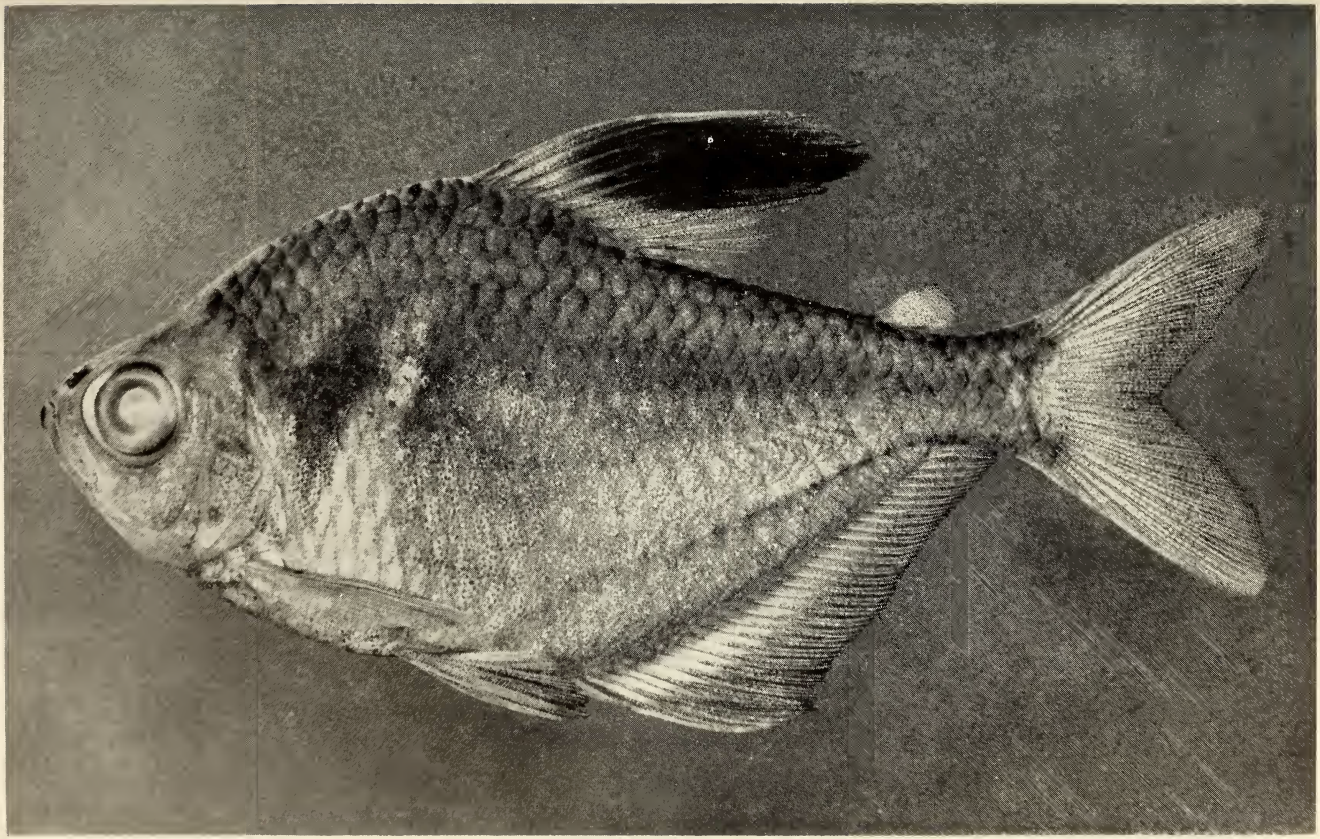

Fig. 1. *Hypessobrycon socolofi*, new species, MZUSP 13181, male, 38.9 mm SL, holotype, Brazil, State of Amazonas, Barcelos, Rio Negro, 1976.

Fig. 2. *Hyphessobrycon socolofi*, new species, MZUSP 13181, male 38.9 mm SL, holotype, Brazil, State of Amazonas, Barcelos, Rio Negro, 1976. Photographed in life.

with slightly convex and nearly horizontal ventral profile of caudal peduncle. Distance between snout tip and pectoral-fin origin 27.3 (27.3–29.7, $\bar{x}$ = 28.5) [29.1–30.4, $\bar{x}$ = 29.8]. Distance between snout tip and pelvic-fin origin 43.7 (43.7–46.3, $\bar{x}$ = 44.9) [46.8–50.1, $\bar{x}$ = 48.4]. Distance between snout tip and anal-fin origin 57.3 (56.5–59.5, $\bar{x}$ = 57.7) [56.9–62.9, $\bar{x}$ = 60.1]. Caudal peduncle depth 10.8 (10.3–11.2, $\bar{x}$ = 10.7) [10.1–10.7, $\bar{x}$ = 10.3]. Caudal peduncle length 10.8 (10.4–11.8, $\bar{x}$ = 11.3) [9.8–11.8, $\bar{x}$ = 11.3].

Head relatively short and deep. Head length 27.0 (26.1–27.7, $\bar{x}$ = 26.9) [27.0–29.6, $\bar{x}$ = 28.6]. Snout blunt and lower jaw protruding beyond upper jaw. Mouth gape angled dorsally. Posterior ventral border of maxillary reaching or nearly reaching a point vertically below anterior border of iris of eye. Horizontal eye diameter 9.8 (9.8–12.1, $\bar{x}$ = 10.9) [9.6–13.1, $\bar{x}$ = 11.6]. Snout length 7.7 (7.5–8.3, $\bar{x}$ = 7.8) [7.8–8.5, $\bar{x}$ = 8.2]. Least bony interorbital width 8.5 (8.3–8.7, $\bar{x}$ = 8.5) [8.3–8.8, $\bar{x}$ = 8.7].

Dorsal-fin rays ii,9 in all specimens (last ray not split to its base). Dorsal-fin length (= length of longest ray) 33.9 (30.4–34.4, $\bar{x}$ = 32.3) [29.1–30.8, $\bar{x}$ = 30.2]. Distal margin of dorsal fin pointed in male, rounded in female. Adipose fin present. Anal-fin rays iv,28 (iv,28 in three, iv,29 in one, and iv,30 in two males) [iv,27 in one, iv,28 in three females]. Last anal-fin ray split to its base. Anal-fin length (= length of longest ray, second branched ray) 22.1 (18.1–20.9, $\bar{x}$ = 19.9) [18.7–21.5, $\bar{x}$ = 20.5]. Margin of anal fin slightly convex to slightly concave. Pectoral-fin rays i,12 (i,12 in six and i,13 in one male) [i,12 in three and i,13 in one female]. Posterior tip of longest pectoral-fin ray reaching beyond pelvic-fin origin. Pectoral-fin length 24.4 (22.9–24.5, $\bar{x}$ = 23.8, n = 5) [21.6–23.6, $\bar{x}$ = 22.6]. Pelvic fin usually reaching posterior to anal-fin origin in mature males and not quite to that origin in females. Pelvic-fin rays i,7 in all specimens. Pelvic-fin length 20.8 (18.6–20.8, $\bar{x}$ = 19.7) [14.5–19.0, $\bar{x}$ = 17.6]. Caudal fin 10/9, its dorsal and ventral lobes equal in length. Small bony hooks present on distal one-half to one-third of fourth unbranched anal-fin ray, one hook per segment except absent on distal 2 to 4 segments. Similar hooks on branched portions of first (anterior) to eighth or tenth branched anal-fin rays. Hooks most common on posterior branch of each fin ray where they occur on each ray segment except for distal 2 to 4 or 5 segments. Anterior branch of each fin ray with an occasional hook. Dorsal fin with second unbranched ray with distally located hooks distributed similar to those of fourth unbranched anal-fin ray. First through third branched rays of dorsal fin bearing small hooks with a distribution similar to those on branched anal-fin rays.

Scales cycloid. Lateral line incomplete; perforated lateral-line scales 10 (7 in one, 8 in one, 9 in two, 10 in five, and 13 in one specimen). Scales

Fig. 3. *Hyphessobrycon socolofi*, new species, USNM 216612, female 38.5 mm SL, paratype, Brazil, State of Amazonas, Barcelos, Rio Negro, 1976. Photographed in life.

in a lateral series 33 (31 in one, 32 in three, 33 in five, and 34 in one specimen). Scale rows between lateral line and dorsal-fin origin 7 in all specimens. Scale rows between lateral line and anal-fin origin 5 in all specimens. Scale rows around caudal peduncle 14 in all specimens. Predorsal scales 10 in all specimens.

Teeth tricuspid. Premaxillary with 2 (2 in nine and 3 in one) teeth in outer row and 6 (5 in one, 6 in six, and 7 in three specimens) in inner row. Maxillary with 10 (3 in one, 4 in four, 5 in three, 6 in one, and 10 in one specimen). Dentary with 5 large teeth followed by 6 small teeth (4–4 in one, 4–5 in two, 5–5 in one, 5–6 in three, 5–7 in one, and 6–10 in one specimen).

Total vertebrae including Weberian apparatus and terminal half centrum 32 (32 in nine and 33 in one). Gill rakers 9/20 in one specimen, 9/17 in another.

Color in alcohol.—(Description from holotype after about 2 weeks in formalin and 6 months in alcohol, Fig. 1). Entire body dusky brown with a dark vertically elongate "shoulder" spot immediately posterior to operculum extending from near pectoral-fin origin dorsally to about 2 horizontal scale rows above lateral line. Body area posterior to this nearly vertical bar paler than remainder of body, including belly (silvery pigment destroyed by initial preservation in formalin). Posterior to pale area, body again dark but comparatively pale posterior to body cavity. A broad, rather poorly defined, dark brown horizontal stripe extends from dorsal region of vertical dark area described above onto caudal peduncle to caudal-fin root. Back above about third horizontal scale row darker than general body color. Top of back anterior to dorsal fin and top of head very dark, similar to a diffuse dark narrow stripe on back along back posterior to dorsal-fin base and extending to dorsal portion of caudal-fin root. Head about same dusky color as back. Opercular and orbital region ventral to eye paler than remainder of head. Scales along base of anal fin very dark, producing a nearly black dusky base to anal fin. Immediately distal to this area base of anal fin nearly white in recently preserved specimens. In specimens preserved for over 1 year white may be absent, leaving this area of fin dusky hyaline. Anterior portion of white of anal fin not extending distally more than half of length of fin rays and usually extending distally less than about one-third of fin-ray length. Distal to white stripe, anal fin hyaline except for a heavy "dusting" of dark chromatophores which is especially dark on about 8 anteriormost rays. Pectoral, pelvic, and caudal fins hyaline except for a fairly dusky appearance produced by scattered dark chromatophores. Dorsal fin with same color except for a large black spot covering nearly two-thirds to four-fifths of distal distance of third to about sixth fin rays and their connecting membranes. Distal half

of second dorsal-fin ray white as are distal tips of third, fourth, and fifth fin rays. Adipose fin dusky.

Color in life.—Brown to black pigment about same as described above under color in alcohol, but much silvery pigment in area of abdominal cavity, on head below eye, and on lower jaw. Both sexes with a "warm" but relatively pale chocolate brown color with an orange-red aspect modified by pale blue and green producing a pale violet appearance. Colors other than brown rather highly reflectant and produced by densely scattered small blue, blue-green, red, orange, and gold chromatophores over entire body. Gold, blue, and green chromatophores especially common on ventral half of body. Back considerably darker than remainder of body. A pink to deep-red spot (sometimes fully as brilliant as red in eye) just dorsal to fifth to seventh lateral-line scales. This spot may cover area of 2 or 3 scales. A similar red color on posterior border of caudal peduncle but this mostly obscured by brown to black chromatophores.

Just anterior to eye and posterior to dorsal one-third of premaxillary is a vertically elongate metallic copper colored bar. Top of head dark brown. Opercle pale bluish to greenish silvery color with scattered brown to black chromatophores. Sometimes scattered pale red chromatophores occur over ventral opercular area. Lower jaw silvery white. Tip of lower jaw and dorsal third of premaxillary dusky brown. Just posterior to dorsoposterior portion of eye occurs a reflectant gold spot (often partly obscured by brown chromatophores) about size of pupil of eye.

Fins dusky hyaline. Caudal fin and pectoral fin without other pigment. White of anal fin (distributed as described above under color in alcohol) with an intense milky appearance. In females milky-white may disappear posteriorly by about tenth to twelfth fin rays whereas in males it may be present posteriorly as far as posterior terminal fin ray. Scattered golden-orange chromatophores occur over remaining parts of anal fin. Distal tips of anal-fin rays with membrane between them nearly black. Pelvic fin with red and orange chromatophores along its basal one-third to one half; distally hyaline. Adipose fin colorless except for scattered dark brown or black chromatophores. Dark spot of dorsal fin distributed as described under color in alcohol. Spot black in life, surrounded basally and anterodistally by white pigment in males which may also contain some orange pigment. In adult females distal "white" area of dorsal fin often a deep intense milky orange color. Some of this orange pigment also occurs in basal "white" areas of dorsal fin in females.

Dorsal half of eye (exclusive of pupil) deep red except for black area immediately dorsal to pupil. Ventral half of eye dusky slivery often with a darker dusky area immediately ventral to pupil. Eye often with appearance of a vertical bar through its center.

Hyphessobrycon erythrostigma (Fowler)
Figs. 4–8

Hemigrammus erythrostigma Fowler, 1943:33, original description, figure, "Brazil," holotype only, aquarium specimen.

Hyphessobrycon rubrostigma Hoedeman, 1956:312, original description, figure, "Colombia," aquarium specimens.—Géry, 1965:22, Igarapé Préto, Brazil, 60 km downstream from the border zone between Peru, Colombia and Brazil.

Hyphessobrycon erythrostigma Sterba, 1970:98, aquarium description and color photograph of adult pair, use of nomenclatural combination credited to Géry *in litt.*—Géry, 1972:7, placed *H. rubrostigma* in synonymy of *H. erythrostigma.*

Material examined.—Holotype, ANSP 70208, 46.4 mm SL, female bearing eggs, aquarium specimen said to be imported from Brazil.—USNM 216613, 8 (43.2–60.6 mm SL), imported aquarium specimens without certain locality but presumably exported from Leticia, Colombia, imported into United States during 1971–1976.—USNM 174944, 6 (29.0–40.8 mm SL) (an additional 7 juvenile specimens not examined), aquarium specimens without certain locality, said to be from Peru, imported 1958. The above material is not satisfactory in terms of locality information but apparently represents the best available. It does have the merit of exhibiting growth changes in morphological characters, especially those associated with the attainment of maturity in the males and therefore provides a guide for future examination of population samples with locality data.

Diagnosis.—This species may be distinguished from all members of the genera *Hyphessobrycon, Hemigrammus* or related genera by the same characters as listed for *H. socolofi* above except that it differs from that species by the following characters. Both sexes with white pigment along base of anal fin extending 75–90% of distal distance onto its anterior lobe (extending no further than about 50% out onto anterior anal-fin lobe in *H. socolofi*), compare Figs. 2 and 3 of *H. socolofi* with Figs. 5 and 6 of *H. erythrostigma.* Vertebrae 33 in all speeimens examined (in *H. socolofi* vertebrae 32, one specimen with 33). Mature adults about 40–60 mm SL (in *H. socolofi* mature adults reach about 30 to nearly 40 mm SL). Length of adults should be examined carefully in wild population samples since it is possible in aquaria to obtain "stunted" adults of *H. erythrostigma* at 30–40 mm SL. Males nearly without small bony hooks in dorsal and anal fins (very old specimens with small, rounded bony processes on theses fin rays) (numerous small bony hooks present in dorsal and anal fins of *H. socolofi*). Mature males with anterior second, third, and fourth dorsal-fin rays about 38–50% of SL (about 30–35% in *H. socolofi*). Mature males with fourth and fifth anal-fin rays about 27–35% of standard length (about

18–22% in *H. socolofi*). Both sexes with snout 6.9–7.9% of standard length (7.8–8.5% in *H. socolofi*).

Description.—Body deep, sides compressed, greatest depth at anterior base (origin) of dorsal fin, 51.1 (36.1–48.2, $\bar{x}$ = 43.2) [36.2–53.5, $\bar{x}$ = 45.6]. Predorsal body profile gently convex but concave at nape and again convex at snout. Body profile along base of dorsal fin straight to slightly convex, nearly straight to very slightly convex between dorsal fin and adipose fin, concove in region of caudal peduncle. Dorsal fin nearer to snout tip than to caudal-fin base. Distance between snout tip and anterior dorsal-fin origin 53.5 (44.7–49.1, $\bar{x}$ = 47.0) [45.9–53.5, $\bar{x}$ = 48.8]; distance between anterior dorsal-fin origin and caudal-fin base 61.2 (56.0–64.7, $\bar{x}$ = 61.0) [54.5–62.5, $\bar{x}$ = 59.2]. Distance between posterior border of eye and dorsal-fin origin as a percent of distance between dorsal-fin origin and caudal-fin base 62.3 (52.9–58.8, $\bar{x}$ = 54.8) [53.2–62.3, $\bar{x}$ = 58.0]. Ventral body profile moderately convex in both sexes between symphysis of lower jaw and anal-fin origin. Body profile strongly convex at origin of anal fin, then nearly straight to gently convex to basal termination of anal fin. Ventral profile of caudal peduncle slightly concave. Distance between snout tip and pectoral-fin origin ? (26.7–30.2, $\bar{x}$ = 28.5) [27.7–30.7, $\bar{x}$ = 29.8, n = 6]. Distance between snout tip and pelvic-fin origin ? (40.9–44.5, $\bar{x}$ = 42.6) [44.3–48.2, $\bar{x}$ = 45.6, n = 6]. Distance between snout tip and anal-fin origin ? (52.0–59.8, $\bar{x}$ = 56.1) [56.6–64.7, $\bar{x}$ = 59.9, n = 6]. Caudle peduncle depth 9.9 (9.2–11.1, $\bar{x}$ = 9.9) [9.6–11.1, $\bar{x}$ = 10.3]. Caudal peduncle length 11.8 (11.4–13.0, $\bar{x}$ = 12.0) [9.8–12.3, $\bar{x}$ = 11.1].

Head relatively deep and short. Head length 27.8 (26.8–28.1, $\bar{x}$ = 27.8) [26.2–29.9, $\bar{x}$ = 28.1]. Snout blunt and lower jaw protruding beyond upper jaw. Mouth gape angled dorsally. Posterior ventral border of maxillary reaching to or somewhat beyond a vertical line drawn ventrally from anterior border of eye. Horizontal eye diameter 11.6 (9.2–14.0, $\bar{x}$ = 11.7) [9.8–13.0, $\bar{x}$ = 11.7]. Snout 7.3 (7.0–8.6, $\bar{x}$ = 7.6) [6.9–7.9, $\bar{x}$ = 7.3]. Least bony interorbital width 8.8 (7.7–9.0, $\bar{x}$ = 8.3) [7.8–8.8, $\bar{x}$ = 8.5].

Dorsal-fin rays ii,9 in all specimens (last ray not split to its base). Dorsal-fin length (= length of longest ray) ? (25.4–50.5, $\bar{x}$ = 37.1) [29.3–33.9, $\bar{x}$ = 31.5, n = 6]. Distal margin of dorsal fin pointed in male, rounded in female. Adipose fin present. Anal-fin rays iv,29 (iv,27 in two, iv,28 in three, iv,29 in two males) [iv,28 in two and iv,29 in five females]. Last anal-fin ray split to its base. Anal-fin length (= length of longest ray, which is either last unbranched or first branched ray) ? (21.9–35.7, $\bar{x}$ = 29.1) [19.7–21.0, $\bar{x}$ = 20.2, n = 6]. Posterior margin of anal fin (beyond anterior lobe) slightly convex but strongly concave anteriorly where it approaches and is continuous with anterior lobe. Pectoral-fin rays i,12 (i,12 in one i,13 in six males) [i,12 in six, i,13 in one female]. Posterior tip of longest pectoral-fin ray reaching beyond pelvic-fin origin. Pectoral-fin length ? (22.0–25.9,

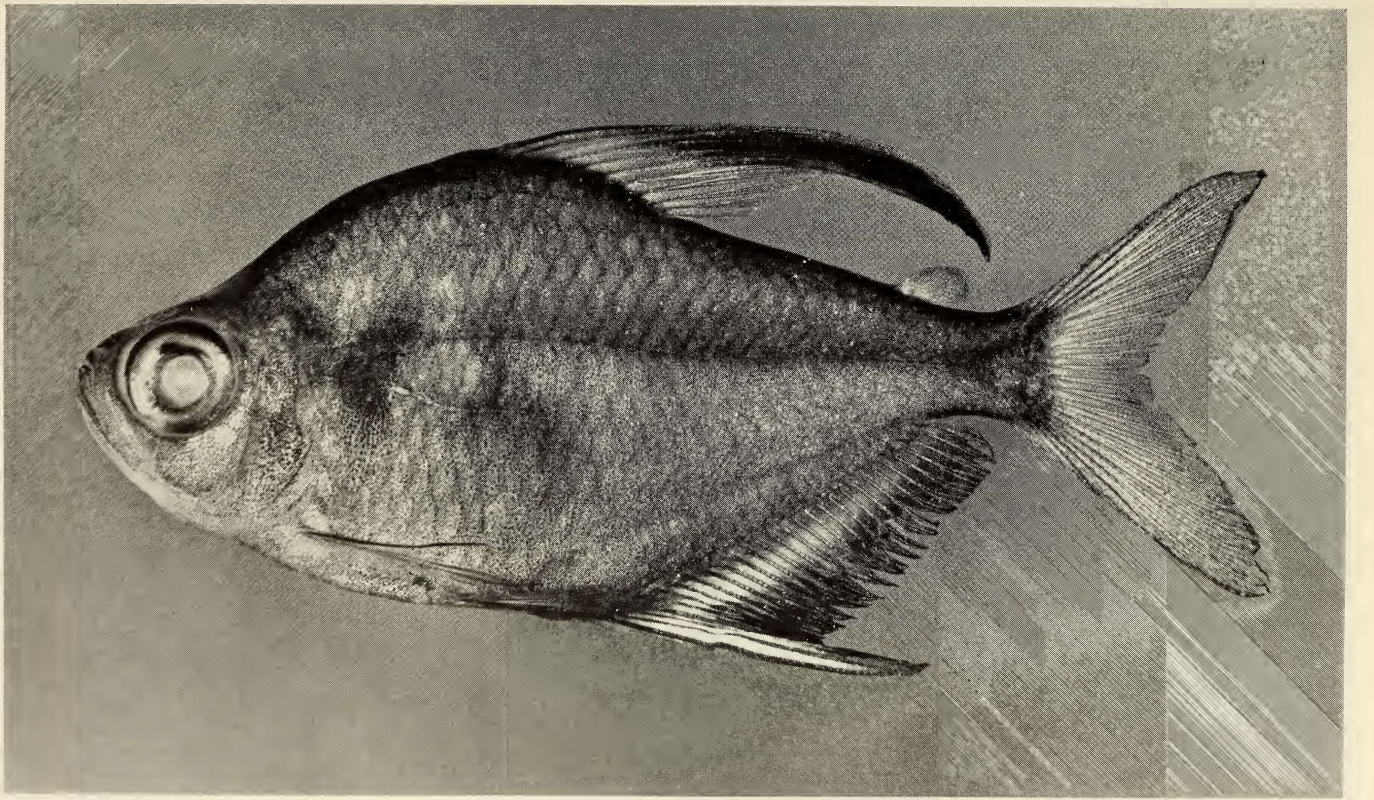

Fig. 4. *Hyphessobrycon erythrostigma* (Fowler), USNM 216613, male 43.2 mm SL, locality unknown but apparently "some distance" west of Leticia, Colombia, 1976.

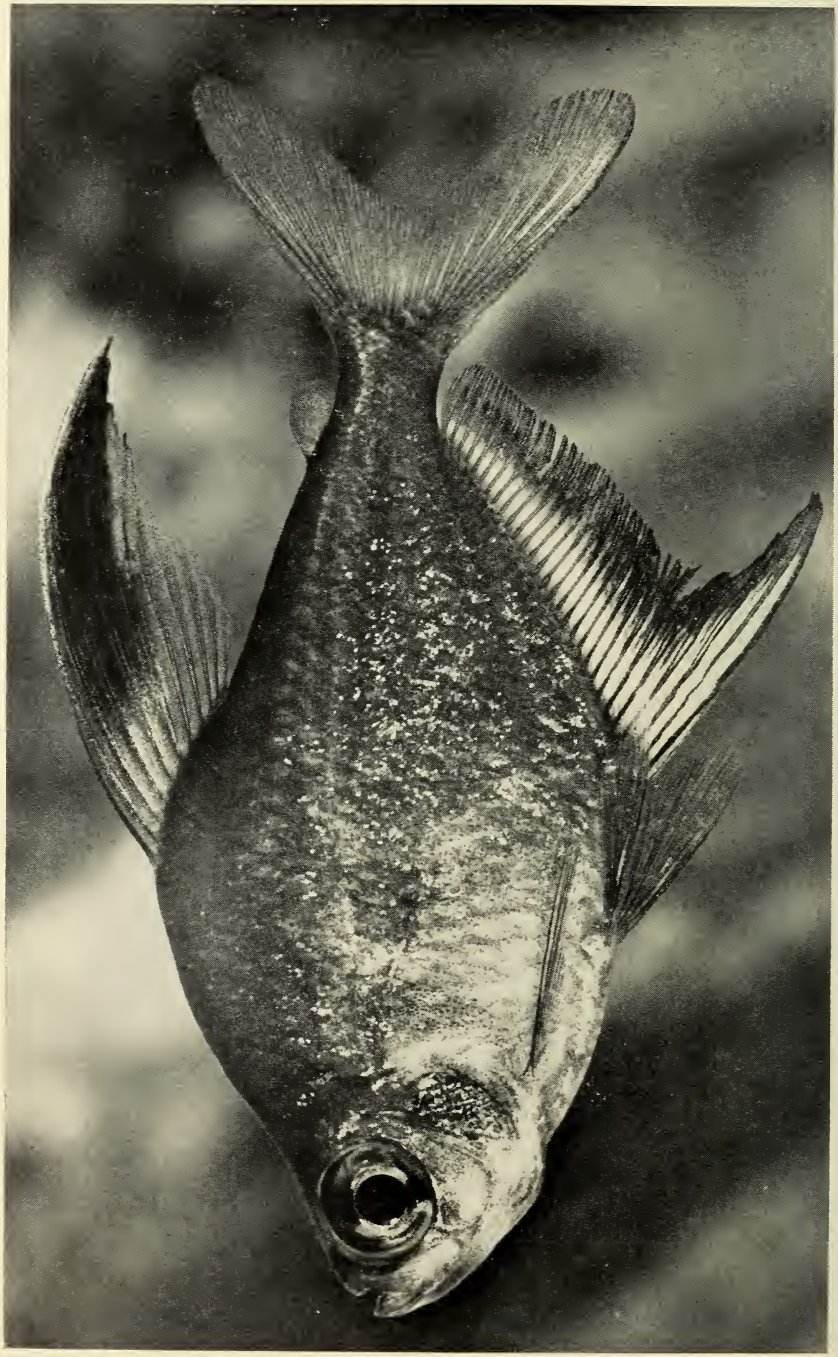

Fig. 5. *Hyphessobrycon erythrostigma* (Fowler), USNM 216613, male 43.2 mm SL, locality unknown but apparently "some distance" west of Leticia, Colombia, 1976. Photographed in life.

$\bar{x}$ = 23.7) [20.7–24.3, $\bar{x}$ = 22.5, n = 6]. Distal pelvic-fin tip usually reaching posterior to anterior anal-fin origin in males and not quite to or just to that origin in juveniles and adult females. Pelvic-fin rays i,7 in all specimens. Pelvic-fin length ? (15.2–28.5, $\bar{x}$ = 22.3) [16.3–20.0, $\bar{x}$ = 18.24, n = 6]. Caudal fin 10/9, its dorsal and ventral lobes equal in length. Bony hooks nearly absent on dorsal and anal fins. Adult males may occasionally have one or two small hooks per fin ray on dorsal and anal fins. When present these hooks distributed among same numbered rays as in males of *H. socolofi*. Two senile males 56.7 and 60.6 mm SL with slight, rounded bony protuberances on fourth unbranched ray through to about eighth branched anal-fin rays and on second unbranched through second branched dorsal-fin rays.

Scales cycloid. Lateral-line incomplete; perforated lateral-line scales ? (9 in two, 11 in three, and 14 in one specimen) [9 in one, 10 in three, and 11 in two specimens]. Scales in a lateral series 34 (33 in one, 34 in twelve, and 35 in one specimen). Scale rows between lateral line and dorsal-fin origin 7 in all specimens. Scale rows between lateral line and anal-fin origin 5 in all specimens. Scale rows around caudal peduncle 14 in all specimens. Predorsal scales 10 in all specimens. In scale counts above, those for holotype were taken from scale pockets and therefore in this specimen perforated lateral-line scales could not be counted and scale rows above and below lateral line not absolutely certain.

Teeth tricuspid. Premaxillary with 3 (1 in one, 2 in five, and 3 in seven specimens) teeth in outer row and 6 (5 in five, 6 in eight, and 7 in one specimen) teeth in inner row. Maxillary teeth variable, 7 (1 in two, 2 in two, 3 in two, 4 in four, 5 in one, 6 in one, and 7 in one specimen). Dentary with 5 (4 in five and 5 in seven specimens) large teeth followed by 7 (5 in one, 6 in four, 7 in two, 8 in five, and 10 in one specimen) small teeth along sides of jaw.

Total vertebrae including Weberian apparatus and terminal half centrum 33 in all specimens. Gill rakers 8/16 in one specimen.

Color in alcohol.—Description from a male 43.2 mm SL (unless otherwise noted) initially preserved in 10% formalin and in alcohol for about six months, Figs. 4 and 5. Entire body dusky brown with dark "shoulder" spot beginning immediately posterior to operculum at a point just dorsal to a level equal in horizontal position to that of ventral border of eye and extending dorsally to about two horizontal scale rows above lateral line. In life, chromatophores of shoulder spot may extend ventrally below level of eye reaching near origin of pectoral fin (see Fig. 5). Area posterior to shoulder spot, paler than remainder of body including belly. Pale region equals area of red spot in life. Posterior to pale area body again dark, sometimes as dark as shoulder spot. This dark area fades posterior to region of body cavity. A broad, rather diffuse, dark brown horizontal stripe ex-

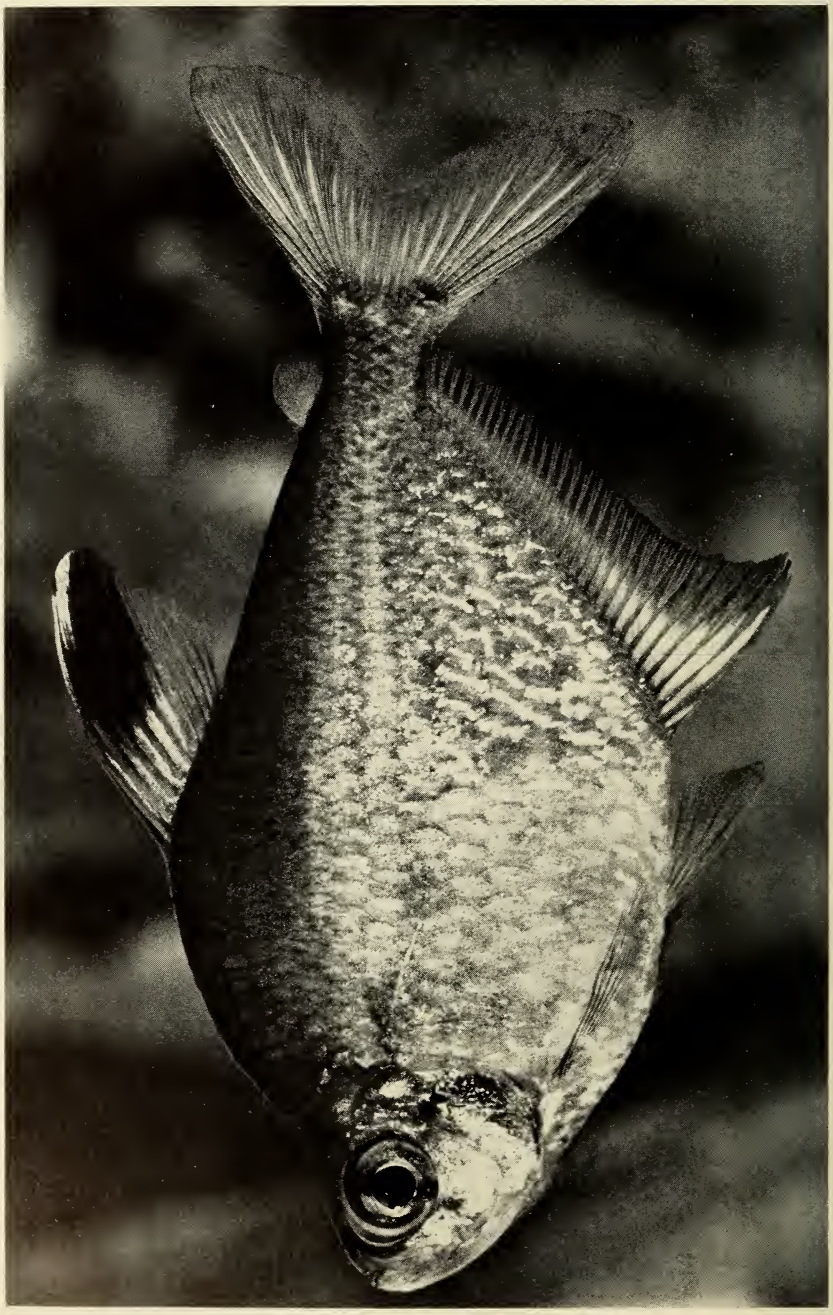

Fig. 6. *Hyphessobrycon erythrostigma* (Fowler), USNM 216613, female 53.3 mm SL, locality unknown but apparently "some distance" west of Leticia, Colombia, 1976. Photographed in life.

Fig. 7. *Hyphessobrycon erythrostigma* (Fowler), ANSP 70208, female, 46.4 mm SL, holotype. Locality unknown.

tends from dorsal region of pale area onto caudal peduncle to caudal-fin root. This poorly defined and often absent (especially in females) stripe occurs just at and dorsal to junction of hypaxial and epaxial myomeres. Back above about third horizontal scale row slightly darker than general body color. Top of back anterior to dorsal-fin and top of head very dark, similar to a very dark diffuse stripe on back along and posterior to dorsal-fin base and extending to dorsal portion of caudal-fin root. Dorsal half of head about same dusky color as back ventral to dark diffuse median stripe. Opercular and orbital region ventral to eye paler than remainder of head. Scales along base of anal fin dark dusky brown with pigment diffusely scattered. Immediately distal to this area base of anal fin nearly white in recently preserved specimens. In specimens preserved for over one year white may be nearly gone, leaving this area of fin dusky translucent. White on anterior portion of anal fin extending distally for more than half of length of fin rays, usually more than 75–80% of their length. Distal to white stripe, anal fin dusky hyaline except for in an occasional specimen having tips of fin rays and membranes between them more dusky than remainder of fin. Sometimes in males anterior 13–15 fin rays and their membranes distal to white stripe so densely covered with dark chromatophores as to appear black. Pectoral, pelvic, and caudal fins dusky hyaline. Dorsal fin with same color except for a large black spot covering two-thirds (in females) to three-fourths (in males) of distal distance of third to fifth or sixth fin rays and their interconnecting membranes. Distal half of second and, in females, third ray also white. Distal tip of fourth fin ray of females often white. These white areas translucent in specimens preserved for a great length of time. Formalin destroys white pigment in this species and in *H. socolofi*. Adipose fin dusky.

Color in life.—Brown to black pigment about same as described above under color in alcohol, but much silvery pigment in area of abdominal cavity, on head below eye, operculum, and proximal three-fourths of lower jaw. Both sexes appearing a "warm" but relatively pale chocolate brown color with an orange to pale red aspect on sides below junction of epaxial and hypaxial musculature. Above this junction, on back, color nearly same except orange and red colors more or less replaced by scattered pale green, blue, and gold chromatophores. Back considerably darker than remainder of body. A deep-red spot (often fully as brilliant as red in eye) just dorsal to or somewhat overlapping six (or often seventh) to ninth or tenth lateral-line scales. This spot may cover area of 1½ to about 3 scales. A similar red color may occur at base of caudal fin but is very pale and often obscured by brown to black chromatophores.

Just anterior to eye and posterior to dorsal one-third of premaxillary is a vertically elongate metallic gold or copper colored bar. Top of head dark greenish brown. Opercle slivery but often with a golden orange

color and scattered brown to black chromatophores. Lower jaw, distal half of premaxillary, and ventral orbital region same color as opercle except distal tip of lower jaw greyish brown. Proximal half of premaxillary greyish dusky brown to black. Just posterior to dorsoposterior portion of eye occurs a reflectant golden-brown spot often obscured by dark brown pigment of head and back. Spot is slightly larger than pupil of eye.

Fins dusky hyaline. Caudal, pectoral, and pelvic fins without other pigment. White of anal fin (distributed as described above under color in alcohol) with an intense milky appearance, especially on anterior 16 to 18 rays. In males white of stripe may be intense to posteriormost anal-fin ray. In females it is often intense only in region of third through eighth or twelfth rays. Scattered golden-orange chromatophores occur over remaining portions of anal fin and are more dense on terminal 10 or 11 rays. Distal tips of anal-fin rays with membranes between rays nearly black. Adipose fin colorless except for dusky chromatophores. Dark spot of dorsal fin distributed as described above under color in alcohol. White areas proximal and distal to black spot may be pale milky orange or a deep rich milky orange in both sexes. Sometimes in males nearly as red as body spot. Sometimes females with a red stripe at base of dorsal fin covering both rays and interradial membranes, sometimes only rays.

Eye same color as described for *H. socolofi* above.

Discussion.—The two species of bleeding heart tetras described above can be distinguished by comparison with the diagnoses given above for each species. The new species, *H. socolofi*, usually has a proportionally shorter snout (6.9 to 7.9% of standard length compared to 7.8 to 8.5% in *H. erythrostigma*); shorter anterior dorsal-fin rays in adult males [30.4–34.4, $\bar{x} = 32.9$ of SL, $n = 3$ (largest males) in *H. socolofi* compared to 38.3–50.5, $\bar{x} = 42.1\%$ of SL, $n = 4$ (largest males) in *H. erythrostigma*]; shorter anterior anal-fin rays in adult males [18.1–22.1, $\bar{x} = 20.4\%$ of SL, $n = 3$ (largest males) in *H. socolofi* compared to 27.4–35.7, $\bar{x} = 30.9\%$ of SL, $n = 4$ (largest males) in *H. erythrostigma*]; somewhat shorter pelvic-fin length in adult males (18.6–20.8, $\bar{x} = 19.7\%$ of SL, $n = 3$ (largest males) of *H. socolofi* compared to 23.0–28.5, $\bar{x} = 24.7\%$ of SL, $n = 5$ (largest males) of *H. erythrostigma*]; numerous small bony hooks on the dorsal and anal fin of the males (nearly absent in the males of *H. erythrostigma*); and usually 32 vertebrae, one specimen with 33 (33 vertebrae in all specimens of *H. erythrostigma* examined). Of the above characters the distribution of white pigment on the anal fin, the length of the anterior rays of the anal and dorsal fins in males (and to a much lesser extent in females) and the generous occurrence of bony hooks in *H. socolofi* appear to offer the best differences between these two very closely related species. All the characters serving best to distinguish the species are associated with sexual dimorphism and

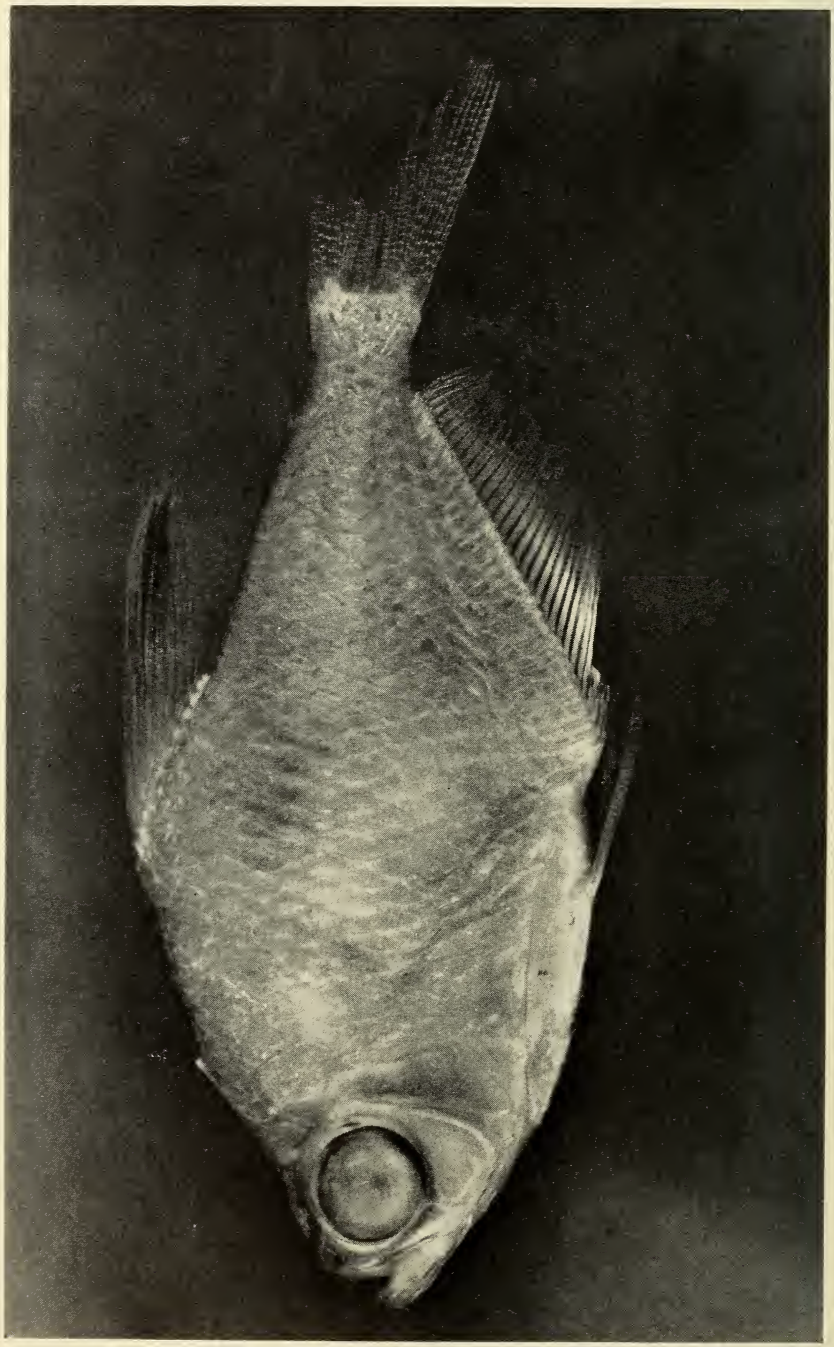

Fig. 8. *Hyphessobrycon erythrostigma* (Fowler), USNM 17944, female, 40.8 mm SL, aquarium specimen, locality unknown but said to be imported from Peru during 1958.

females of the two species are occasionally difficult to distinguish, even in life.

Discovery of a species of bleeding heart tetra from the Rio Negro of Brazil raises the problem of the identification of the holotype of *Hemigrammus erythrostigma*, said to be an ". . . aquarium fish without locality, supposed to have been secured in Brazil," Fowler (1943). Is this holotype identifiable with the bleeding heart tetra from the Peruvian, Colombian and Brazilian border region or with the new species from the Rio Negro in Brazil? The holotype of *H. erythrostigma* is a female in very poor condition, apparently having been dead for several hours before being preserved. There is a growth of fungus still preserved on its back, most of the gill structures are gone, and the body cavity is open ventrally and almost empty except for nearly ripe eggs. Preserved females of the two species of bleeding heart tetras described here are somewhat difficult to tell apart and the most distinctive character, the distribution of white on the anal fin, is completely absent in Fowler's holotype. Females of the two species may also be distinguished by the concave border of the anterior region of the anal fin of *H. erythrostigma* compared to the straight or slightly convex border in *H. socolofi*. The anal fin of the holotype of *H. erythrostigma* has been somewhat eroded but it appears distinctly concave. Furthermore the holotype of *H. erythrostigma* has 33 vertebrae, a greater standard length than any known specimen of *H. socolofi* and a snout length 7.3% of the standard length, all charatcers typical of the Peruvian and/or Colombian species. It is here proposed that the holotype of *H. erythrostigma* is a specimen of the species found in the border region of Peru, Colombia and Brazil.

The relationships of *H. socolofi* with *H. erythrostigma* are probably quite close. They share in detail a complicated and highly apomorphic color pattern not found in other rosy tetras such as *Hyphessobrycon rosaceus* Durbin which lack the bright red spot on the side of the body as well as the white stripe in the anal fin. Fowler (1943) assigned *H. erythrostigma* to *Hemigrammus* rather than to *Hyphessobrycon* claiming that the species had scales on the caudal fin (absent in *Hyphessobrycon*). The holotype is nearly scaleless now and no signs of scale pockets can be found on the badly eroded caudal fin. Examination of the caudal fins of both *H. socolofi* and *H. erythrostigma* reveals scales only at the base of the fin lobes, typical for *Hyphessobrycon*. Although assignment of the various species of rosy tetras to the genus *Hyphessobrycon* needs considerable study in order to attempt to understand their relationships with the various species of similar-appearing tetras assigned to the genus *Megalamphodus* Eigenmann, I here accept *Hyphessobrycon* as a temporary generic placement for rosy tetras pending further studies of these fishes now in progress.

Acknowledgments

I am grateful to Mr. Ross Socolof for specimens of both species herein described and for attempting to obtain good locality data for them. W. L. Fink and Robert Kanazawa helped to photograph the specimens while Marilyn Weitzman provided technical assistance. Naércio Menezes translated the summary into Portuguese.

This research was partially supported by the Smithsonian Institution Amazonian Ecosystem Research Program under the direction of Clifford Evans.

Resumo

Neste trabalho descreve-se um novo characideo, *Hyphessobrycon socolofi*, coletado no Rio Negro em Barcelos, Estado do Amazonas, Brasil. É feita também a redescrição de *Hyphessobrycon erythrostigma* Fowler (1943), espécie que tem sido coletada para o comércio de peixes ornamentais nas áreas de Leticia, Colombia e Tabatinga, Brasil e que tem uma grande afinidade com a nova espécie.

Exemplares vivos de ambas as espécies podem ser separados dos outros membros do grupo "rosy tetra" de *Hyphessobrycon* porque possuem uma mancha vermelha no corpo, logo atrás da mancha humeral escura e uma faixa branca estreita ao longo da base da nadadeira anal. Exemplares fixados das duas espécies distinguem-se das outras espécies de *Hyphessobrycon* por meio da seguinte combinação de caracteres: nadadeira dorsal com uma mancha negra grande que cobre cerca de ⅔ de sua parte distal; nadadeira anal escura sem uma parte distal branca ou clara envolvendo o terceiro e quarto raios; partes basais dos raios anteriores da nadadeira anal brancas (ou claraes em exemplares fixados a longo tempo, não tão densamente pigmentadas de marron escuro como no restante da nadadeira); mancha humeral escura seguida posteriormente por uma área pálida (que é vermelha em exemplares vivos) e depois por uma área escura difusa que corresponde aproximadamente à parte dorsal posterior da cavidade do corpo; maxilar com 3 a 10 dentes em exemplares adultos; premaxilar com 2 e ocasionalmente 3 dentes na série externa, 5 a 7 dentes na série interna; todos os dentes são tricúspides; altura do corpo cerca de 40% a 50% do comprimento padrão; escamas perfuradas da linha lateral, 7 a 14; escamas laterais em uma série longitudinal, 31 a 35; raios da nadadeira anal iv, 27 a 30; vértebras, 32 ou 33.

As duas espécies podem ser separadas com base nas seguintes características: os machos de *H. socolofi* possuem numerosos ganchos ósseos pequenos nos raios das nadadeiras dorsal e anal (quase totalmente ausentes em *H. erythrostigma*); os machos adultos de *H. socolofi* tem os raios anteriores da nadadeira dorsal e os lobos anteriores da nadadeira anal mais curtos que os machos de *H. erythrostigma*; a área branca no lobo anterior da

nadadeira anal em ambos os sexos se estende por uma área maior na nadadeira de *H. erythrostigma* do que na nadadeira de *H. socolofi*.

Estas duas espécies exibem um padrão de colorido apomórfico único e muito semelhante e por isso parecem ser mais intimamente relacionadas entre si do que a qualquer outro characideo do grupo "rosy tetra." As duas espécies são extremamente semelhantes em vida. Ambas são bem maiores que as demais espécies conhecidas deste grupo. *H. socolofi* atinge um comprimento padrão de pouco mais de 39 mm, enquanto que *H. erythrostigma* atinge pelo menos 60 mm.

Literature Cited

Eigenmann, C. H. 1917. The American Characidae, part 1. Mem. Mus. Comp. Zool. Harvard College 43(1):102 pp.

Fink, W. L., and S. H. Weitzman. 1974. The so-called cheirodontin fishes of Central America with descriptions of two new species (Pisces: Characidae). Smithsonian Contrib. Zool. No. 172:1–46.

Fowler, H. W. 1943. Description of a new South American characin referred to *Hemigrammus*. Fish Culturist (Pennsylvania Fish Culturists' Assoc.) 22(5): 33–34.

Géry, J. 1965. Poissons characoïdes sud-américains du Senckenberg Muséum, II. Characidae et Crenuchidae de Igarapé Préto (Haute Amazonia). Senckenbergiana Biol. 46(1):11–45.

———. 1972. Corrected and supplemented descriptions of certain characoid fishes by Henry W. Fowler, with revisions of several of their genera. Studies on the Neotropical Fauna 7(1972):1–35.

Hoedeman, J. J. 1954. Über die Verbreitung der *Hyphessobrycon-callistus*-Gruppe und die systematische Stellung der sechs Formen. Aquarien-und Terrarien-Zeitschrift 7(5):109–112.

———. 1956. *Hyphessobrycon rubrostigma*, neue Species. Eine höchst interessante und farbenfreudige Form der Callistus-Gruppe aus Kolumbien. Aquarien-und Terrarien-Zeitschrift 9(12):312–313.

Sterba, G. 1970. Süsswasserfische aus alles Welt, Teil 1. 2nd edition, Urania Verlag, Leipsig, Jena, Berlin. 350 pp. 144 plates.

Weitzman, S. H., and W. L. Fink. (in press). Interrelationships of the neon tetras, a unique group of South American characids (Pisces), with comments on the interpretation of the phylogeny of New World characoid fishes. Smithsonian Contrib. Zool.

Department of Vertebrate Zoology, National Museum of Natural History, Washington, D.C. 20560.

Addendum.—After this paper went to press two large live specimens, about five or six years old, (USNM 216969, a male 55.6 mm and a female 56.3 mm SL) of *H. socolofi* were received from Mr. Rosario La Corte. These specimens indicate that *H. socolofi*, as *H. erythrostigma*, reaches between 50 and 60 mm in standard length. The morphological characters distinguishing *H. socolofi* from *H. erythrostigma* are evident in these additional specimens.